

Technology Intelligence: A Powerful Tool for Competitive Advantage

Stephen E. Rudolph, Ernest R. Gilmont, Andrew S. Magee, and Nancy F. Smith

Among the many management and planning tools that are available to help companies identify, develop, and implement technology, one is often overlooked or underutilized: technology intelligence. Technology intelligence – a special form of competitive intelligence – can significantly reduce risk and open new opportunities.

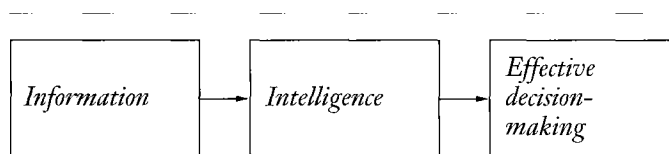
What Intelligence Means

Intelligence in this context is a response to a specific question or issue, structured to provide a basis for action and presented to an individual or group empowered to act. It is worth noting that information is not intelligence, and gathering information is not carrying out competitive intelligence. Many companies have mechanisms to accumulate large amounts of information; significantly fewer companies have mechanisms for conducting competitive intelligence.

Intelligence uses information as raw material, screening, sifting, sorting, verifying, analyzing, interpreting, and compiling it to create a useful output. And just as information is raw material for intelligence, intelligence is raw material for a higher-level process: decision-making (Exhibit 1). Thus, at the heart of the whole competitive intelligence activity are management decisions.

Exhibit 1

Information, Intelligence, and Decision-Making



For the purposes of this discussion, technology intelligence is defined as the collection, analysis, and application of publicly available information on external activities in technology that could affect a company's business. The value of technology intelligence as a management tool is that it improves the quality of strategic and operational decisions by adding the perspective of external conditions and events.

However, technology intelligence can provide value and exert influence on the fortunes of the organization only if it is inextricably linked to the decision-making process. Similarly, the decision-making process can derive benefit from technology intelligence only if it is structured to demand that technology intelligence be provided as an essential part of its basis for informed action. Thus, the two must be designed to be inseparable partners. For example, R&D organizations often have important competitive information but don't require that this information be reviewed as part of the project-approval process.

Without technology intelligence, an organization cannot develop a realistic picture of its current technology position or an achievable vision of its future technology success. Yet many companies neglect this powerful tool. A 1988 Conference Board study of competitive intelligence indicated that although 90 percent of respondents to a survey of 308 companies felt that competitive intelligence is very important or fairly important to them, only 10 percent felt that they were very effective in using it. More recently, an Arthur D. Little survey of senior research and technology managers drew similar responses.

The Benefits of Technology Intelligence

These results suggest that many companies have a real opportunity to derive more benefit from competitive intelligence as they strive to realize the power of technology in their businesses. The benefits include reduced risk and enhanced opportunities.

Reduced Risk. Many technology-related decisions involve placing bets on the viability of products, projects, and technologies. While these decisions are inherently risky, the degree of risk can be reduced by better understanding the external environment. For example, technology R&D programs may fail for any number of technical or economic reasons, but in fact often fail because management neglects to anticipate competitive forces. A number of biotechnology companies pursued the development of the blood-clot-dissolving drug, TPA,

while largely ignoring an existing drug, streptokinase, which was later discovered to have similar efficacy with similar administration – and which cost less by a factor of 50.

It is useful to view technology intelligence as a way to answer the key questions that should be asked about every new technology or product development program (Exhibit 2). Clearly, these questions are difficult to answer. Nevertheless, the process of continually striving to answer them can generate critical information. This information, in turn, can help management make the right decisions on a variety of issues, ranging from funding levels to timing and product specifications.

Exhibit 2

Key Questions to Ask

If our program is successful:

- Who will share the market with us?
- When will they enter?
- What technology will they use?
- How much market share will they capture?

In this way, technology intelligence helps management control a variety of risks common to technology management. These include:

- The risk of being blindsided by a competitor's technology after having made a very large investment in a new development (as instant movie film was blindsided by videotape technology)
- The risk of choosing the wrong technology to enter a new area or incorrectly reading the basis of technological competition (as word processors have been replaced by personal computers)
- The risk of basing product offerings on standards or specifications that differ from current or future industry standards (as computers requiring nonstandard peripherals or software perished in the market)
- The risk of early product obsolescence caused by a new technology trend (as factories based on outmoded technology have been closing in droves)

In these examples and many others, technology intelligence could have provided insight, warning signals, and extremely valuable calibration of internal technology against the external technology environment.

An excellent example of the role of technology intelligence in reducing R&D risk is the case of a major food processing company. The company had invested more than \$8 million in a four-year research effort in an area outside its core business. As part of a comprehensive examination of this effort, the company asked Arthur D. Little to help it conduct an evaluation of all competing technologies under development worldwide. Through extensive reviews and interviews (Exhibit 3), we identified two competitors with proprietary technologies that were close to commercialization and were also in the core businesses of their companies, giving them advantages in terms of customers, distribution and marketing. As a result, the company terminated the research program and reinvested the remaining funds elsewhere.

Stopping the project at this point saved the company many more millions of dollars in out-of-pocket costs, as well as substantial time and opportunity costs. Clearly, requiring technology intelligence as an essential component of project approval and funding decisions at the very start of the work would have saved a lot more trouble and expense.

Enhanced Opportunities. Technology intelligence is much more than a risk-reduction technique. It is also an extremely rich source of opportunities that would not otherwise be recognized. Careful examination of external technology, products, and business conditions can reveal windows of opportunity in many areas (Exhibit 4). As a result of the careful monitoring of new technologies in artificial sweeteners worldwide, NutraSweet successfully identified and licensed a new high-intensity sweetener that will extend the firm's product line when patents on Aspartame expire in 1992.

The benefits that technology intelligence can bring to controlling risk and identifying opportunities in technology are opposite sides of the same coin. Both applications can substantially improve the odds of technology success. Both are important in structuring a technology intelligence program that brings lasting value to the organization.

Exhibit 3

Sources of Technology Intelligence

Literature review Patent review Interviews with:

- Internal scientists
- External scientists
- Academics
- Market experts

As an example, consider the approach of a major consumer products company involved in the development of a new food additive. This development entailed high risks and high costs since it had to be approved by the U.S. Food and Drug Administration (FDA), a process requiring extensive documentation of toxicological acceptability. Recognizing that 10 years or more might be required to reach the marketplace, this company used technology intelligence both to manage risks and to identify opportunities.

Exhibit 4

Opportunities Revealed by Technology Intelligence

- Gaps in patent coverage
- Partnering opportunities
- Licensing opportunities
- Technologies ripe for transfer
- Unmet customer needs

During development of the product, the company followed in detail every external technology and every competitor that might affect its intended product category. Technologies were evaluated in terms of potential performance and cost. Companies were evaluated in terms of how their products, patents, and research interests might be extrapolated to future competitive products. Through this program, the company continually monitored the potential competitive success of the new product. More important, by creating profiles of possible future competitive products, the program sharpened management decisions regarding features, economics, and market positioning.

In this case, however, the technology intelligence effort went beyond the process described above. Recognizing that currently unknown chemical compositions totally different from the ones they had chosen might provide the same product functionality, the company anticipated the competition by identifying, preparing, and patenting these materials. This step not only significantly expanded the company's window of technology ownership, but revealed promising opportunities for second-generation products.

Managing the Process

Our experience suggests four fundamental principles to follow in managing an effective technology intelligence program: Start with decisions, put someone in charge, look ahead, and keep your guard up.

Start With Decisions. When many organizations think about developing a more robust picture of the competitive environment, they start by identifying information sources and installing collection programs. This approach is a dead end. It leads to a glut of information that may have potential value but little practical value.

The right way to launch a technology intelligence program is by reviewing important management decisions and identifying those that can benefit most from intelligence input. Next, identify the specific questions concerning the external climate that must be answered to facilitate these decisions. Then, decide how to modify the decision process so that it becomes unacceptable to proceed without the required intelligence insight.

These three steps define the agenda for the technology intelligence program. The goal is to deliver responses to specifically targeted issues against a defined schedule.

Put Someone in Charge. The idea that tracking the competition is „everyone's job“ doesn't work. This approach produces an occasional snippet of useful information (not intelligence) that may or may not find its way to someone who can benefit from it. It's much better to assign specific responsibility to an individual or

group that knows what is necessary and has a mandate to recruit help from around the organization as needed. Don't ignore what employees learn opportunistically in the normal course of business, but don't depend upon it. Also, unless the technology intelligence effort has a budget and the enthusiastic support of senior management, it won't be successful.

Look Ahead. It is easy to create a „snapshot in time“ that describes the competitive status of a technology or business on the basis of currently available data. At best, these data are about six months out of date. To be of really significant value, intelligence should project the climate at some important moment in the future. This requires a high level of strategic analysis, a different set of information sources, close integration with business planning functions, a clear understanding of internal goals and objectives, and real skill in forecasting. While the results won't always be accurate, the effort is well worthwhile.

For example, an international agribusiness firm had identified potential product opportunities in herbicides, fungicides, and plant growth hormones. In order to decide where best to invest its R&D funds, the company conducted a detailed evaluation of the likely future competitive environment in these product categories. The evaluation used a wide range of sources: academic agrochemistry specialists, filings with regulatory agencies, industry consultants, discussions with U.S. Department of Agriculture R&D officials, competing product trends, patent searches, scientific literature, and marketing projections. This study revealed that the state of the art in plant growth hormones made the likelihood of a practical discovery within 10 years very low, and that the company's R&D position in insecticides was weak compared to its competitors. As a result, the company determined to put most of its resources into promising leads in herbicides and fungicides.

Keep Your Guard Up. No company is immune from becoming the focus of someone else's competitive intelligence effort. It pays to think about what you reveal to the outside world in the course of your everyday business activities. Some companies find it useful to ask an outside organization to see what can be learned about their own activities – often with surprising results.

Companies facing competition from Japan, in particular, need to understand the Japanese attitude that competitive intelligence is part of the basic fabric of Japanese business culture. It is not a separate activity, but rather a part of all activities. Japanese business people believe that they must employ the best technology and that „to be best, you must know best.“ Their counterparts in other countries would be well advised to learn from their example.

Who Needs Technology Intelligence?

Technology intelligence is likely to be especially useful for organizations that check the „high“ column for most of the characteristics listed in Exhibit 5.

Technology intelligence may be relatively less important in those cases where technological change is slow, where technology is not an important part of the basis of competition, or where the strategy is to pursue a „me-too“ position. Even in these cases, however, it is wise not to ignore the potential impact of a technology from another industry or miss the leverage of a technology that could change internal operations. For example, the transfer of microwave technology from the aerospace industry to culinary applications has had a tremendous impact on the appliance industry – and on the food and packaging industries.

Properly conceived and managed, a technology intelligence program can be a powerful tool for sustained competitive advantage.

Exhibit 5

Characteristics Determining Need for Technology Intelligence

	<i>High</i>	<i>Medium</i>	<i>Low</i>
Proportions of large, long-term projects in the R&D portfolio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Importance of introducing a regular flow of new products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Significance of R&D in driving the future growth of the business	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Probability of entering entirely new technologies in 3–5 years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Importance of technology as a differentiating factor in products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Percentage of products requiring regulatory approval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pace of technological change in the environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Importance of market entry timing in business success	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Stephen E. Rudolph is a vice president of Arthur D. Little, Inc., and managing director of the firm's Technology and Product Development consulting practice. He has responsibility for consulting activities in plastics, adhesives, coatings, packaging, materials, metals, formulated products, analytical instrumentation, personnel protection, and other products requiring expertise in applied chemistry, engineering, and materials science.

Ernest R. Gilmont is a senior consultant in Arthur D. Little's Industry Management Section. His consulting work has concentrated on the areas of R&D organization and management, technology assessment, acquisition analysis, and diversification.

Andrew S. Magee is a senior consultant in the Product Technology Section of Arthur D. Little. His consulting work focuses on the application of organic chemistry in product development and R&D management.

Nancy F. Smith is vice president of Arthur D. Little, Inc., and managing director of the firm's -Food Industry Practice. Her areas of particular interest are technology evaluation and management, industry analysis, and product and process development.